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OFF-FARM LABOR SUPPLY IN A DEVELOPING ECONOMY*

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ABSTRACT

This paper reports on a study testing the new household economics for explaining off-farm labor supply of a sample of Philippine farm households. Labor supply for husbands was very elastic with respect to off-farm wage rates. Farm size and number of children were also important explanatory variables.

INTRODUCTION

Recent research by Anderson and Leiserson, Chuta and Liedholm, and Meyer and Larson reported the importance of nonfarm work and income for farm households, especially in Asian countries. In many cases, over half the total household income is earned from nonfarm enterprises. In the extreme cases of small farms in Japan and Taiwan, over 70 percent of average household income comes from nonfarm sources. It is further argued that nonfarm enterprises in rural areas, many of which are small-scale, offer several advantages compared to the large-scale firms usually encouraged by development policies. These advantages include the large amount of employment generated, relatively efficient use of capital, their geographic dispersion and a large domestic and international market for their products.

These research results imply that rural development strategy in developing countries should be broadened to increase employment in nonfarm enterprises. Unfortunately, few detailed household studies have been made to determine the nature of labor supply response in developing countries to nonfarm work opportunities. Little is known about the allocation of time by members of the farm household and the extent to which standard neoclassical theory can predict household behavior. Butz argued that standard theory is relevant in developing countries, but only three studies have been located which test that assertion regarding off-farm employment. Larson and Hu reported on a study of labor allocation in a sample of Taiwanese households. Evenson analyzed home,

farm and market time for husbands and wives for a sample of farming and nonfarming Philippine households. Quizon limited her analysis to time allocation to home production in another sample of Philippine households.

This paper reports some results from a study testing a labor supply model estimated with data collected from a sample of Philippine households.[1/] The analysis follows the earlier work of Evenson. The sample is limited to households which farm some land in the rice-growing region of Laguna Province. Besides the theoretical interest of the research, the results are important because of the attention the Filipino government has given to increasing nonfarm employment as part of its rural development strategy. The impact of this policy will be determined in part by the response of farm households.

THE MODEL

The home commodities model developed by Becker and extended by Gronau provided the basic theoretical framework for this study. The following assumptions are required: the farm family has a utility function which it maximizes, and has an accurate perception of the value of its nonmarket time; no institutional constraints limit the time spent in off-farm work; unlike off-farm work, it is assumed that additional time worked on the farm is subject to diminishing returns; the household possesses a given stock of land, labor and capital, has a single period planning horizon, and has no overriding preference for farming.

The study analyzed labor supply for both husbands and wives, but space permits presenting only the results for husbands. The empirical model based on a two-person household was:

$$T = f(W_{Fh}, W_{Mh}, W_{Fw}, W_{Mw}, V, E)$$

where T measured the number of days husbands worked off the farm for wages. Husbands not working off the farm were recorded as zero days.

W_{Fh} and W_{Fw} are estimates of the value of the husband's and wife's farm work. The measurement of these variables followed Evenson's innovation in specifying the value of family labor in terms of cost of replacement by hired labor. The reported wage rates for each task were weighted by the amount of time reportedly spent performing that task. Theoretically, an increase in the husband's own on-farm wage rate (i.e. the marginal value of farm time) is expected to reduce the off-farm labor supply. An increase in the wife's on-farm wage is expected to have a positive effect on the husband's off-farm labor time if their time inputs are substitutes, and negative if they are complements.

W_{Mh} and W_{Mw} are estimates of imputed off-farm wage rates. Wage rates were inputed based on a regression estimated with human capital attributes of age and education. An important issue is to test the relative importance of income and substitution effects which will determine if total off-farm labor time of the husband increases or decreases with increases in the off-farm wage rate. An increase in the wife's off-farm wage rate is expected to reduce the husband's off-farm labor supply if time inputs are substitutes in home and market activities.

The variable U represented nonearnings income including imputed returns to farm capital, net rental income and remittances. An increase in this income is expected to reduce off-farm labor supply so long as home time is considered a productive resource and home goods are regarded as normal goods.

The variable E refers to a set of environmental variables that are relatively fixed in the short-run. Farm size was included because of the negative relation found between it and off-farm work in other studies. The possible substitution between capital and labor was tested by including a variable for farm mechanization. Size of dwelling was included because of the expected negative effect on off-farm labor supply, especially for women. Three variables to reflect age and number of children were included: number of children under 7 years, between 7 and 15, and older than 15. It is expected that additional young children may encourage increased off-farm work by husbands to substitute for the wife's loss of income. As the age of children increases, it is expected that they first engage in home production, and later may even substitute for some of the parent's time in off-farm work.

THE RESULTS

Data were obtained from 188 farm households covering a twelve-month period ending April 1977. All households had both spouses and farmed at least one-half hectare.

Table 1 reports selected descriptive statistics of the data. For the total sample, husbands averaged about 29 days of

TABLE 1: Selected Characteristics of Sample Households

Characteristics	Sample Mean	Type of Household[a/] (1)	(2)	(3)	(4)	F-Ratio[b/]
No. of Observations	188	127	38	13	10	
Days Worked Off-Farm						
By Husband	28.7	0.0	110.3	0.0	105.4	48.458***
By Wife	17.2	0.0	0.0	183.0	77.3	75.629***
Daily Wage Rates[c/]						
Husband's On-Farm Replacement Cost	27.4	29.9	22.3	28.0	15.5	0.007
Husband's Imputed Off-Farm Wage	19.5	19.4	19.7	19.6	21.0	1.499
Wife's On-Farm Replacement Cost	13.5	12.7	9.6	30.5	16.1	2.582*
Wife's Imputed Off-Farm Wage	5.5	5.5	5.5	5.5	5.1	0.240
Farm Characteristics						
Farm Size (ha.)	2.4	2.7	1.9	2.2	1.4	2.520*
Machine Stock per ha. (Pesos)	1,678	1,705	2,036	1,399	396	0.743

a/ The households are classified as follows: 1=neither husband nor wife work off the farm; 2=husband works off-farm, wife does not; 3=husband does not work off-farm, wife does; 4=both husband and wife work off-farm.

b/ $F = \frac{\text{Between Groups Mean Square}}{\text{Within Groups Mean Square}}$. The degrees of freedom are 3 and 184 for the numerator and denominator, respectively. * = significant at the 0.10 level, *** = significant at the 0.01 level.

c/ Rounded to nearest peso. All earnings and income reported in Philippine Pesos. In 1977, 7 ₱ = 1 US Dollar.

off-farm work compared to 17 days for wives. The sample was divided into four groups depending on whether or not the husband, wife, or both worked off the farm. In the sample, 127 households reported no off-farm work by either spouse. Another 38 households with only the husband working off the farm reported 110 days worked off-farm by the husband. Thirteen households reported an average of 183 days worked off-farm, while their husbands reported none. The final group of 10 households with both spouses working reported an average of 105 days for husbands and 77 by wives. Off-farm income, including earnings from children, averaged 13 percent, and increased from 9 percent for the first group to 40 percent for group four.

Although not statistically significant, the average values for husband's on-farm and off-farm wage rates were consistent with the pattern of labor allocation. Husband's reported off-farm work only in groups two and four. These two groups had relatively lower on-farm wages and relatively higher off-farm wages than the other two groups. Surprisingly, that relationship did not hold up for wives as they worked off-farm only in groups three and four when their on-farm wages were highest. The results were also mixed for farm size and mechanization. Husband's worked more off-farm when farm size was smallest, but there was no clear relation between machinery stock and work.

Tobit analysis was used for the regression model because of the possible truncation bias that may arise with observations clustered at zero work days. Table 2 presents the results. One

TABLE ': Regression Coefficients and Related Statistics for Models of All Farm Husbands Using Tobit Analysis[a/]

Independent Variables	Regression (1)	Partial Elasticities	Regression (2)	Partial Elasticities
Intercept	-445.7642*** (2.62)		-435.9772*** (2.57)	
Husband's On-Farm Wage	0.2259 (0.49)	0.032	0.1824 (0.44)	0.030
Husband's Off-Farm Wage	17.3997** (2.17)	3.072	18.5587** (2.33)	3.791
Wife's On-Farm Wage	-1.0457 (1.22)	-0.125	-0.6111 (0.78)	-0.084
Wife's Off-Farm Wage	-1.5967 (0.11)	-0.079	1.6271 (0.12)	0.093
Nonearnings Income	-0.0029 (0.22)	-0.017	0.0089 (0.62)	0.060
Farm Size			-38.7082*** (2.53)	-0.986
Machinery			0.0031 (0.425)	0.049
Young Children			39.9757** (1.92)	0.254
Middle Children			0.6574 (0.06)	0.014
Older Children			8.8067*** (2.60)	0.215
Dwelling			-0.2420 (1.178)	-0.256
-2λ [b/]	6.242		29.171***	
Predicted Probability of Off-Farm Work	0.246		0.214	
Observed Frequency of Off-Farm Work	0.255		0.255	
Expected Mean of T_{Mh} [c/]	27.1112		23.2276	
Observed Mean of T_{Mh}	27.9046		27.9046	

a/ The absolute values of "t" are shown in parentheses. These are not exact t-tests. They are asymptotically normal variables. The reference to "t-tests" is to provide an analog to ordinary least squares regression. * = significant at 0.10 level; ** = significant at 0.05 level; *** = significant at 0.01 level.

b/ λ is the log of the likelihood ratio. For large n, -2λ is distributed chi-square with k degrees of freedom, where k is the number of explanatory variables in the regression other than the constant. This is analogous to an F-test on a vector of coefficients in standard O.L.S. regressions.

c/ The expected mean of T_{Mh} is calculated at the mean of all explanatory variables.

model was estimated with just the wage and nonearnings income variables, and a second included the environmental variables. The test of significance for Tobit analysis, -2λ, indicates the hypothesis that all coefficients are zero can be rejected at the .01 level for the second model, but not for the first.

The substitution effect of wages clearly outweighs the income effect as shown by the significantly positive coefficient for husband's off-farm wage rates in both models. Furthermore, the response is highly elastic with a wage rate elasticity over 3.[2/]

The variables for husband's on-farm wage, wife's on-farm and off-farm wages, and nonearnings income were all insignificant. Farm size had the expected negative sign with a partial elasticity of about 1. Machine stock, however, was not significant. The variables for children gave mixed results. Young children had the expected positive effect, while the variable for the middle group was insignificant. The variable for older children was also positive when it was expected that they might substitute for their father's off-farm work time. Confidence in the model explaining household behavior is gained from the similarity between expected and observed probability of off-farm work and number of days worked.

IMPLICATIONS

These results are encouraging regarding the use of the new household economics in the analysis of time allocation of farm

households in developing countries. The surprisingly high elasticity of off-farm labor supply response for husbands suggests that Filipino policies to increase off-farm work will be successful in attracting workers from farm households, especially from small farms. The income distribution effects should be positive because (at least in this survey) small farms earned lower farm income, but total household income was highest on the average for groups three and four where both spouses spent the most time off the farm.

A number of caveats are required, however. First, space did not permit presenting the regression results for the analysis of wives. As in Evenson's study, these results were generally less satisfactory. This may be due to data problems or to the fact that the wive's primary on-farm activity when working off-farm is tending livestock. As noted in Table 1, wives worked off the farm in only 23 households, but the wives worked a far greater number of days off-farm when the husbands did not, than did the husbands when their wives reported no off-farm work. It is possible that women had more difficulty finding work, so the days worked are less affected by wage rates.

Second, Laguna is a relatively favored region in the Philippines. The labor market should be expected to operate more efficiently in transmitting information about job availability and wages than in other more remote areas. Therefore, a policy to increase rural job availability may be more successful in this region than elsewhere. This same comment may apply to the Taiwanese case studied by Larson and Hu because Taiwan

is a small country, relatively homogeneous, and served by good transportation and communication.

Even if it could be clearly established that members of farm households respond to off-farm work opportunities, a problem policymakers face is to identify the type of specific industry to promote to increase employment. It is likely that some, perhaps most, of the work reported by these Philippine households was part-time and/or seasonal rather than full-time year-round. Thus, any industry that is promoted must be able to adjust it's labor demand to time availability of farmers. This is feasible for certain types of handicraft production, but difficult for many of the more capital intensive manufacturing industries.

Future research in this area should be pursued in two directions. One is to continue to explore the dynamics of time allocation in the farm household in areas not as developed as those where the few existing studies have been conducted. The second is to carefully analyze the type of industry that is applicable for the type and seasonality of labor supply available from farms. The potential may well exist to ease rural poverty through off-farm work, but these studies would help clarify the detailed mechanisms for implementing the strategy. Policymakers must have much more detailed and specific information than they have received to date.

FOOTNOTES

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1/ Complete results of the study are found in Smith.

2/ Sexton found the uncompensated wage elasticity for a sample of Illinois farm operators to be 1.71.

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